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National Technical Information Service**

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HANDBOOK FOR PREPARATION OF WORK BREAKDOWN STRUCTURES

National Aeronautics and Space Administration
Washington, DC

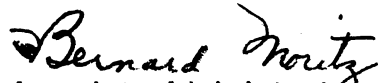
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PREFACE

The purpose of this handbook is to provide broad policy guidelines for use in the development of work breakdown structures for NASA programs, projects, and contracts. It is arranged so as to provide a planning and management tool which is applicable to all NASA Program Offices and Field Installations and at any level of management when the scope or nature of any program or project, in the judgment of the appropriate Program Director or Director of a Field Installation, warrants the use of work breakdown structures.

Program Directors or Directors of Field Installations may wish to issue documents which expand upon the concepts contained in this handbook for work under their cognizance. Users are expected to apply common sense in determining where appropriate variations and adaptations are necessary in individual situations, providing that these do not constitute a departure from the basic concepts and intent. Advance approval of substantive variations and adaptations will be secured from the Assistant Administrator for Procurement.

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Associate Administrator for
Organization and Management

HANDBOOK FOR PREPARATION OF WORK BREAKDOWN STRUCTURES

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CHAPTER 1: INTRODUCTION

100 GENERAL

This Handbook provides guidelines for preparation of Work Breakdown Structures (WBS) in conformance with NHB 9501.2A, "Procedures for Contractor Reporting of Correlated Cost and Performance Data," and NHB 2340.2, "OSSA/OART Project Management Information and Control Systems (MICS)."

101 SCOPE

This Handbook discusses the WBSs required to support NASA programs, projects and related contracts.

102 WORK BREAKDOWN STRUCTURE (WBS)

Generically, a WBS is a family tree subdivision of effort required to achieve an end objective (e.g., program, project, contract, etc.). The WBS is developed by starting with the end objective required and successively subdividing it into manageable components in terms of size and complexity, such as program, project, system, subsystems, components, tasks, subtasks, and work elements. It should be product or task oriented and should include all the necessary effort which must be undertaken to achieve the end objective.

To assure compatibility with the evaluation of programs and projects, this Handbook deals specifically with the Program/Project Work Breakdown Structure (PWBS), and their interrelationships. It also relates WBS preparation activities to the NASA program/project planning and approval process.

103 APPLICABILITY

The Handbook is to be used as a NASA and contractor guideline for preparation of WBSs as follows:

1. For NASA programs and/or projects... (PWBS).
2. For preparation of preliminary Contract Work Breakdown Structures (CWBS)s to accompany Requests for Proposals (RFP)s.
3. For preparation of CWBSs to be ultimately negotiated into NASA contracts as well as the contractors extension of the CWBS.

Figure 1-1 indicates the development sequence and relationship of program/project and contract WBSs.

A WBS should be prepared for each NASA program/project to cover in-house and contractor efforts. There is no single "best way" to prepare a PWBS or a CWBS. The examples provided in Chapter 4 are only to illustrate the general hierarchy of systems, subsystems and lower level WBS elements. In individual cases, the hierarchy and structure of a WBS must suit the goals and objectives of the particular program or project.

Work breakdown structures shall be prepared by NASA program or project offices in conformity with the following:

1. The PWBS shall be prepared to be compatible with the NASA Agency Wide Coding Structure defined in NASA Financial Management 9100 (FMM 9100).
2. The PWBS shall be prepared as early as project definition will permit.
3. The PWBS shall be further refined and changed, as design concepts change, to reflect new systems and subsystem approaches.
4. Until a project is authorized by Project Approval Document (PAD), the PWBS is a flexible working tool; but when the PAD is approved, normally the PWBS becomes formalized as the project outline, and all changes to it should be formally approved by the Program Office except for CWBS changes below contract reporting levels.
5. Project Work Breakdown Structures and Contract Work Breakdown Structures shall be prepared in conformity with NHB 9501.2A, "Procedures for Contractor Reporting of Correlated Cost and Performance Data," and NHB 2340.2, "OSSA/OART Project Management Information and Control Systems (MICS)."
6. The preliminary CWBS is developed from the basic elements of the PWBS and expanded for use in the RFP, preparation of proposals, and the evaluation and selection process.
7. The preliminary CWBS shall be developed by NASA project personnel through no more than the three highest levels of the proposed contract.
8. Normally, only the top three levels of the CWBS will be specified by NASA in an RFP. Until it is finalized as a result of negotiation and incorporated formally into the contract, the CWBS is considered a preliminary CWBS.
9. When high risk items are located at low WBS levels, these items can be identified against the higher level WBS element of which the high risk item is a part. It is not necessary or desirable to extend the CWBS below the top three levels in order to identify the high risk item.

105 WORK BREAKDOWN STRUCTURE EVOLUTIONARY PROCESS

As shown in Figure 1-2, the creation and finalization of required PWBSs and CWBSs must parallel the process of evolving NASA programs and projects as described in NMI 7121.1B "Planning and Approval of Major Research and Development Projects." Programs and projects usually begin as a result of in-house efforts on advance studies, advance research and technology, or as a derivative of on-going programs. These efforts lead to the formulation of projects.

WORK BREAKDOWN STRUCTURE (WBS) LEVEL IDENTIFICATION

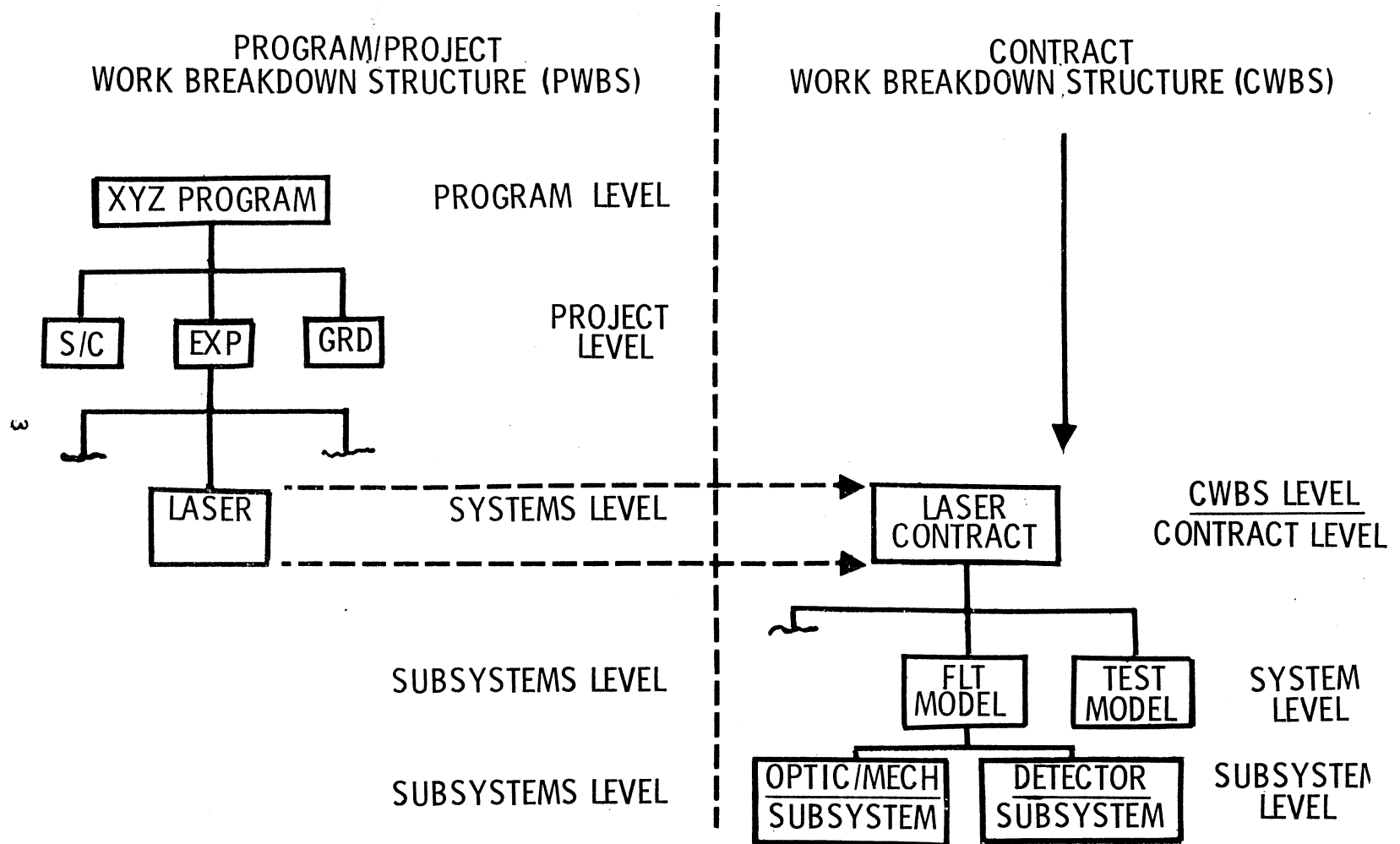


FIGURE 1 - 1

RELATIONSHIP - NASA ACQUISITION PROCESS (*) AND WORK BREAKDOWN STRUCTURES

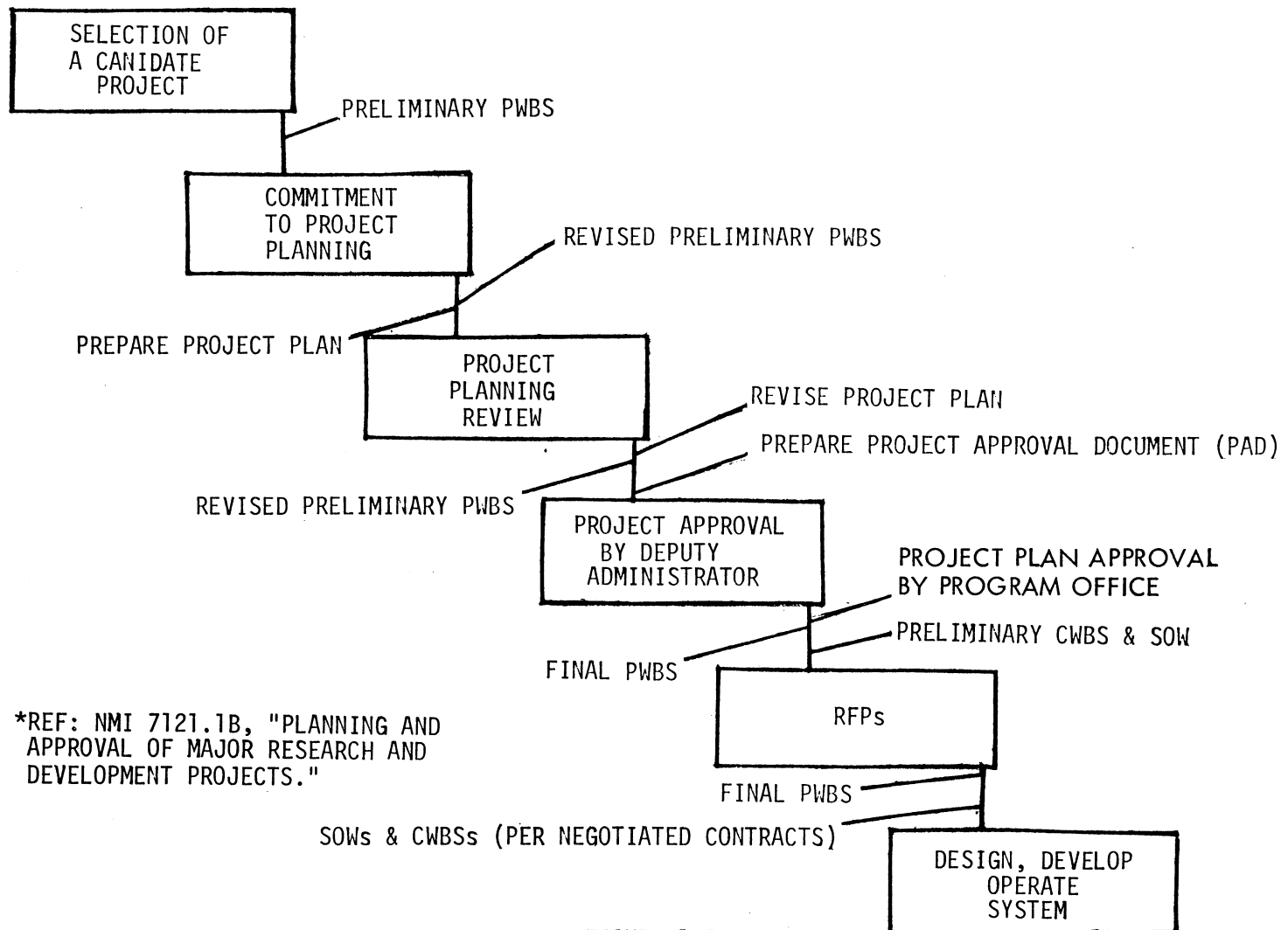


FIGURE 1-2

As soon as the program management believes the project has reached a stage of definition where it is feasible to establish the preliminary work breakdown structure, it should be prepared and used to assist in the preparation of the Project Plan and the Project Approval Document (PAD). The preliminary project development process is an iterative process. During its early phases the preliminary work breakdown structure may be revised as necessary. Once the project is established in sufficient depth, procurements may be planned by using selected PWBS elements to develop preliminary CWBSs. Preliminary CWBSs are incorporated into the RFPs, subsequent proposals, and eventually finalized in the executed contract(s) based on negotiations.

CHAPTER 2: PREPARING THE PROGRAM/PROJECT WORK BREAKDOWN STRUCTURE

200 INTRODUCTION

A NASA program is a related series of activities which continue over a period of time (normally years) and which are designed to accomplish broad scientific or technical goals or increase knowledge in an area of aerospace science or engineering. Program responsibility is assigned to the appropriate program office within NASA Headquarters. A NASA project is a basic building block in relation to the NASA program. It represents varying aggregations of individual jobs or tasks, each of which is planned, approved and managed at the appropriate level, such as:

1. A discrete and definable quantity of work or end product with a clearly recognizable beginning and end;
2. An effort which cannot be specified as a discrete and definable quantity of work, other than by stating the end purpose or goal in broad terms, and cannot be precisely scheduled for completion;
3. Advanced and conceptual studies which are directed toward preliminary assessment and planning of new and as yet unapproved missions or facilities.

201 APPLICATION AND PURPOSE

For a program or project, the work breakdown structure is developed by starting with the end objectives and then successively subdividing these objectives into the systems, subsystems, and lower level WBS elements which are the necessary steps to achieve the end objective. The purpose of the PWBS is to provide for planning and control by subdividing the work into smaller increments until a manageable unit is reached. A top down approach is used to insure that the total program or project is fully planned and all derivative plans contribute directly to the desired end objectives.

202 ORIENTATION TO PROGRAMS AND PROJECTS

Individual PWBSs are developed from program budget levels downward on a project-by-project basis. These, in turn, become the basic framework for the assignment of responsibility, execution of the project and its component parts, establishing plans, allocating resources, assessing status, evaluating performance and reprogramming. Management control and reporting may vary on either a program or project basis. In either case, the PWBS should be oriented to the levels reported to and controlled by the program or project manager and should be compatible with the program and project breakouts contained in FMM 9100. Examples of a program work breakdown structure and a project work breakdown structure are given in Tables 4-1 and 4-2 to indicate their relative relationships.

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1. Preparation

In preparing a program/project work breakdown structure, the program is first broken down by project, then into major systems such as launch vehicle, spacecraft, data acquisition and reduction system, systems integration, launch operations and project management. A system such as the spacecraft is then subdivided into major subsystems such as structure subsystem, power subsystem, telemetry subsystem, etc. The work breakdown continues to successively lower levels, reducing the scope, complexity and dollar value of each WBS element at each successively lower level. The configuration, content and level of detail of the PWBS will vary from project to project depending on:

- a. complexity and time span of the project;
- b. estimated cost of the project;
- c. NASA program/project management structure;
- d. number of contracts and their relationships;
- e. contractor/NASA relationships;
- f. contractors' organizations;
- g. NASA management needs and objectives.

2. Considerations which must be reviewed in preparing the PWBS are:

- a. Agency-Wide Coding Structure (AWCS). Top level structure breaks must be compatible with the AWCS to insure validity and integrity in basic agency financial records.
- b. Scope and Nature of Effort. The manner in which the work effort and resources reporting is structured is dependent on whether the objectives of the mission are research, flight mission, or service mission.
- c. Organizational Responsibilities. Organizational responsibilities and structuring of the work must be mutually compatible to insure that accountability to progressively higher levels of management can be identified. If the project extends across more than one center, the PWBS should clearly reflect the division of responsibility and existing interfaces. NASA in-house versus contractor responsibilities, as well as project versus functional responsibilities, must be taken into account.
- d. Contract Work Breakdown Structure. Contract work breakdown structures shall be established to facilitate summarization of resource information into the PWBS.
- e. Configuration Management. High risk items will be identified in appropriate PWBS elements. However, such items need not be shown as a separate WBS element.
- f. Cost Projection Information Requirements. The PWBS should consider possible future needs for cost estimating and projecting data, particularly where separation of recurring and nonrecurring costs may be desirable.

- g. Requirements and Resource Correlation. The PWBS is used as a means of inherently providing correlation between schedules and resource requirements for accomplishing the defined work in accordance with the performance specifications.

204 LEVEL IDENTIFICATION AND CODING

The concept of structuring work breakdown structures by "level" is a formalized and disciplined approach to identify the indenture of elements within the PWBS. Numerical identification of upper levels will vary depending on the unique project code found in NASA Financial Management Manual 9100. The top level reported in FMM 9100 is known as a unique budget program. It is followed in order by:

1. Project: See paragraph 200 for a definition of project.
2. System: One of the principal functioning entities comprising the project hardware within a project or flight mission. The terminology may vary to suit a particular project. Ordinarily, a system is the first major sub-division of project work.
3. Subsystem: The name of the next level of a work breakdown structure below the system level. (A subsystem is a functional entity within a system.)

The above breakdown is fairly standard throughout NASA; however, it is possible that software and management elements may appear at system and subsystem levels. There are numerous terms in use which define succeeding levels of the PWBS below the subsystem level such as equipment, assembly, subassembly, component, and part. The choice of which to use must be made by project management. The most important feature about PWBS levels, however, is that they accurately portray successive levels of indenture from the top level down to those levels at which management controls are to be applied. Normally, NASA will control only to the top three levels of the CWBS. Below the levels identified in FMM 9100, elements will be coded to permit:

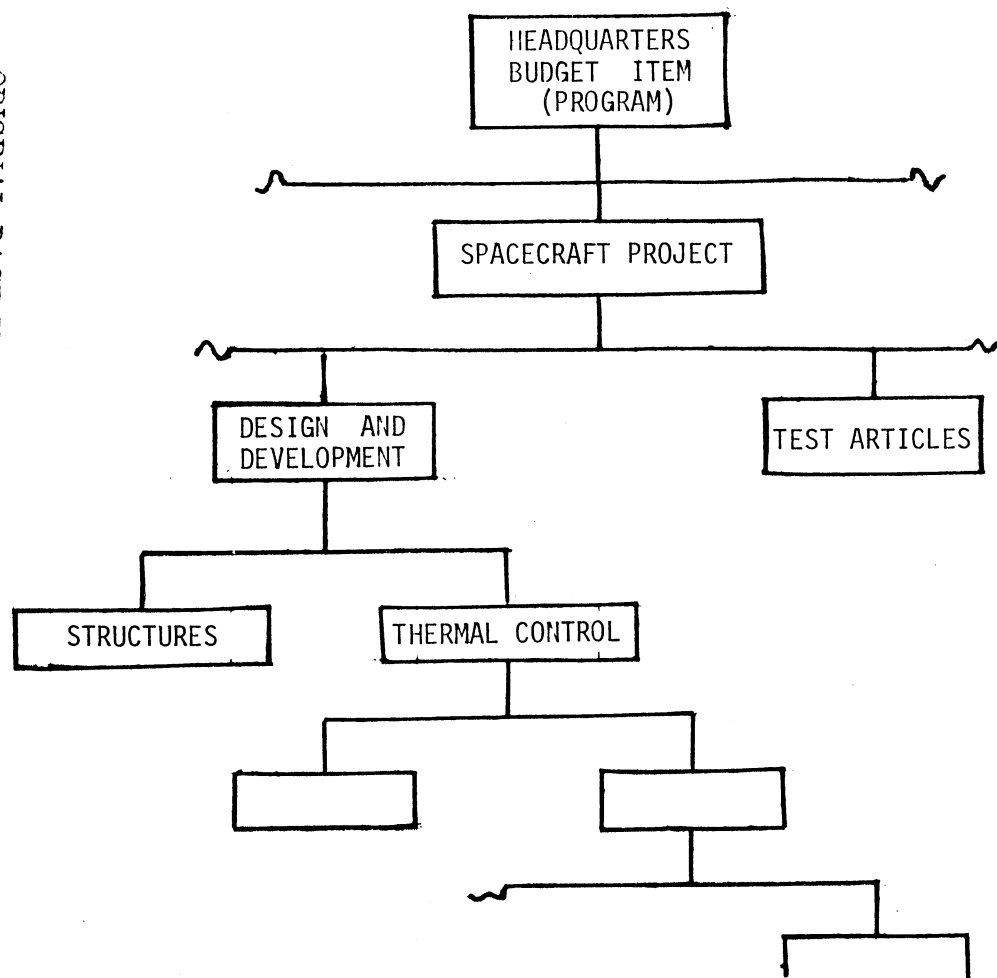
1. Summarization by level;
2. Correlation with the Agency-Wide Coding Structure; and
3. Compatibility with contract work breakdown structures.

A properly structured PWBS will readily allow complete aggregation of cost, schedule and performance data from appropriate lower elements up to the unique program level. A simplified decimal or alpha-numeric coding system is recommended which will logically represent elements by levels. It must be possible to identify the indenture of one element to another and also to accommodate the coding of contract work breakdown structures which may appear at various levels within the PWBS. Complete standardization and uniformity will probably not

be possible since contractor coding systems vary within their own management systems. Where possible, contractors should be instructed to follow the basic system in use in the PWBS. If reasonable ease of conversion is not possible without substantial cost, a coding interface conversion system will have to be applied down to the CWBS control levels, or as a minimum at the top level of the CWBS. An example of PWBS level identification is shown in Figure 2-1.

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UNIQUE BUDGET-PROGRAM

UNIQUE PROJECT

SYSTEM

SUBSYSTEM

W B S LEVELS

W B S LEVEL IDENTIFICATION

FIGURE 2 - 1

CHAPTER 3: PREPARING THE CONTRACT WORK BREAKDOWN STRUCTURE (CWBS)

300 INTRODUCTION

The CWBS is the basis for dividing the contract effort into definable increments or elements from which the Statement of Work can be developed and the technical, schedule, cost and manpower reporting can be established. It provides a clearer relationship of total project work requirements for Statement of Work preparation, evaluation of proposals, selection of winners and negotiation of definitive contract requirements. It relates the tasks to each other and to the end product(s). Hence, the CWBS must be end item oriented and contain all project work to be accomplished under the contemplated contract.

301 APPLICATION AND PURPOSE

Whenever NASA Form 533 reporting is required, (i.e., Cost and Fixed Price Incentive contracts over \$100,000 and one year duration), a preliminary CWBS will be prepared by the NASA procuring agency through not more than the top three levels of the CWBS. The prospective contractor shall prepare his proposal, in accordance with his internal management and reporting system, by extending the preliminary CWBS to lower levels as necessary.

302 PREPARATION OF CWBS

The preliminary CWBS is developed as an extension of the PWBS. NASA project personnel will prepare a preliminary CWBS, following basically the same fundamental steps described in Chapter 2 (paragraphs 202, 203 and 204). This will identify WBS elements normally not below the top three levels of the CWBS.

The offeror will be instructed in the RFP to extend the preliminary CWBS as low as necessary to identify and structure the work effort to achieve the end objective(s) of the contract. The offeror will develop these lower subdivisions of the preliminary CWBS in a manner which will assure compatibility with his organization and management system.

NASA Centers should follow basically the same procedure for in-house work. Here again, the project officer must provide flexibility for the performing centers, laboratories or offices to structure the lower WBS tiers for compatibility with their needs. While the preliminary CWBS is normally derived from the PWBS, there should be no reluctance to request a change in the PWBS when the change is needed to accommodate an essential requirement of the proposal. Elements of the preliminary CWBS shall be selected to permit maximum flexibility to offerors in preparing their proposals.

303 SOLICITATION AND EVALUATION

The preliminary CWBS provides the basic summary structure from which NASA will make its evaluation comparisons for contractor selection. The preliminary CWBS elements selected for use in an RFP should take this need into consideration. However, there is an inherent danger which must be avoided at all costs. This is the tendency to develop the preliminary CWBS to a level sufficiently low to cause conflict with industry's normal management practices; hence, it is especially recommended that the CWBS structure not be developed below the top three levels.

CWBSs may be primarily oriented to contract hardware or introduce functional segregation at very high levels, but most contractors will construct their CWBS elements to reflect a hardware/functional relationship at a relatively high level, frequently, just below the subsystem level. The level at which a contractor introduces the functional relationship with his planning depends upon the nature of his overall work responsibilities and the way he is organized to discharge them. The contractor with a vertical or project approach, with all functional responsibilities under the direct and complete management control of the program manager, will probably introduce the non-hardware or functional interface at lower levels than one who has multiple contracting in a single center, and the functional services such as design engineering, testing, manufacturing, etc., are basically purchased from those functional organizations.

For NASA evaluation purposes, offerors must prepare their proposals based on the CWBS included in the RFP. However, the RFP CWBS may not always be compatible with the way offerors plan to organize and manage the contract. Accordingly, the RFP should recognize this fact and encourage offerors to propose an alternate CWBS when needed. To qualify for consideration, offerors submitting alternate CWBS's must additionally submit a proposal based upon the RFP CWBS.

304 NEGOTIATION

The preliminary RFP CWBS, as extended by the offeror, or the alternate CWBS, whichever is contained in the selected proposal, will be the basis for negotiation of the CWBS. The established CWBS will become the common denominator for all communication in government/contractor interface and work planning, performance and control. It may be changed to meet NASA and/or contractor requirements during negotiations. However, alterations to the CWBS after the contract is signed will require that the contract be amended if such alterations are within the level(s) cited in the contract.

305 CONTRACTUAL USE OF THE CWBS

Once negotiated, the top levels of the CWBS (not lower than the third level), will be incorporated into the contract and may not be changed except by amendment of the contract. Care should be exercised

to assure that only those CWBS elements essential to NASA program/project management are included in the contract, because it is highly desirable to have the flexibility to make changes to low level elements without resort to the contractual change process.

Provision should be made to incorporate the CWBS top levels into the contract through use of the following contract clause:

"A contract work breakdown structure has been negotiated between NASA and the contractor, the top levels of which are formally incorporated into the contract as set forth in Exhibit attached. The elements shown in this Exhibit may not be changed except by contractual action. Lower tier elements which are not shown in this Exhibit may be changed by the contractor as appropriate, provided, that notification of such changes is provided to the NASA Contracting Officer."

306 CODING STRUCTURE

The coding structure used by the contractor for planning and accumulating costs must be compatible with the program/project coding structure so that contractor reports can be incorporated directly into program/project reports.

In addition, the contractor must code the CWBS to facilitate meaningful summarization of related data from the lowest to the highest levels of the CWBS.

307 CWBS ELEMENTS

CWBS elements are the subdivisions of effort under the contract down to the work package level. They represent the various levels of indenture through which the data is summarized from the lowest to the highest tiers of the contract. There are fundamentally three kinds of work to be included in manageable packages of work to be performed.

1. Discrete work packages with a definable end result.
2. Level-of-effort work packages whose completion does not produce a definable end result, but reflects time-phased application of levels-of-effort over the time frame planned for performance.

Examples:

- a. Program Management
- b. Quality Assurance
- c. Long Life Reliability
- d. Manufacturing Engineering

3. Apportioned effort which does not produce a measurable end result, but relates closely to other tasks which are measurable. (Normally, apportioned effort is pro-rated against related work tasks.)
 - a. Pickling
 - b. Plating
 - c. Painting

In structuring the CWBS, there are certain principal considerations which must be recognized and taken into account.

1. The CWBS is not an end in itself; it is a tool used to facilitate program management. As such, management objectives and needs must play a dominant role in the way and the level to which the CWBS is developed. The CWBS must reflect and represent the way work efforts are to be organized, managed and accounted for.
2. Each CWBS element must be interfaced with the organization responsible for accomplishing that element. There must be flexibility to establish these interface elements at meaningful and appropriate levels. Otherwise, management systems may be undermined and management by assigned responsibility may be seriously impaired. Figure 3-1 is an example of interface elements and illustrates the need to plan for flexibility as to the level at which such interfaces occur.

For example:

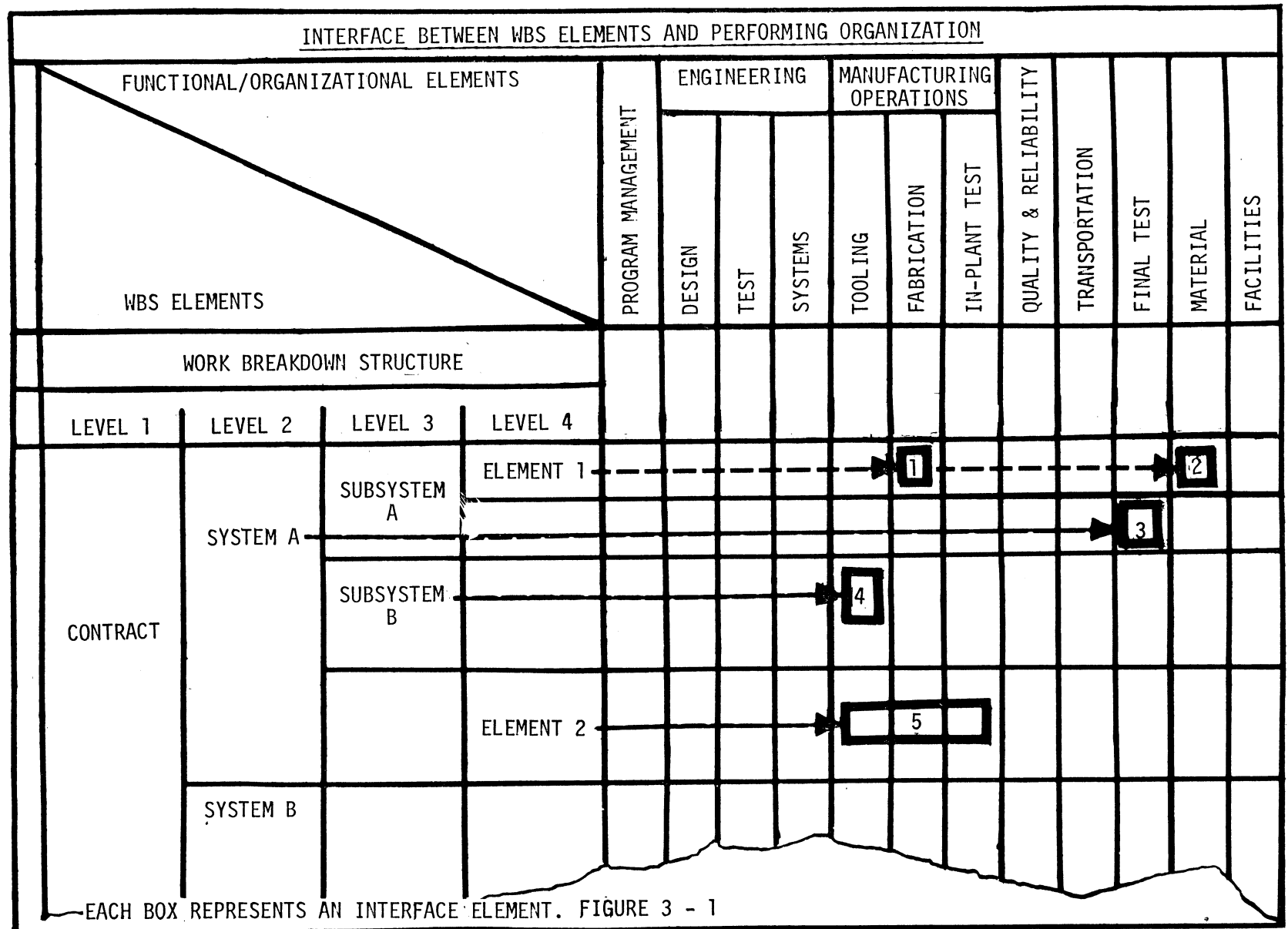
Box 1 indicates that the Manager-Fabrication will be responsible for manufacture of Element 1 and under Box 2 the Manager-Materials will be responsible for material to be used for Element 1.
Box 3 indicates that the Manager-Final Testing will be responsible for final test of the System.
Box 4 indicates that the Manager-Tooling is responsible for all tooling for Subsystem B.
Box 5 indicates that the Manager-Manufacturing Operation is responsible for tooling, fabrication and in-plant test of Element 2.

In preparing the preliminary CWBS, the project office will also prepare an accompanying dictionary of CWBS elements using the format shown in Figure 3-2. One or more descriptions for each preliminary CWBS element will be provided as part of the CWBS portion of the RFP. In responding to the RFP, the offeror will use a similar dictionary to explain:

1. The work to be performed;
2. Quantity of hardware to be developed and delivered; and/or
3. The software or services to be furnished; and
4. Other significant data which describe the nonrecurring and

"products" of each CWBS element.

There should be an identifiable relationship between the work packages and the subtasks of the SOW. While there is not necessarily a need for a one-to-one relationship, each WBS work package should be relatable to a task or subtasks of the SOW.



19

CWBS ELEMENT

[FOR EACH DESIGNATED ELEMENT OF THE CWBS, DESCRIBE THE WORK TO BE PERFORMED, INCLUDING QUANTITY OF THE HARDWARE FOR BOTH DEVELOPMENT AND DELIVERY OR OTHER SIGNIFICANT DATA WHICH DESCRIBES THE NON-RECURRING AND RECURRING "PRODUCTS" OF THE WBS ELEMENT]

FIGURE 3 - 2

CHAPTER 4: PWBS AND CWBS CHECKLISTS AND EXAMPLES

400 INTRODUCTION

This Chapter contains checklists for use in preparing both program/project and contract work breakdown structures. Examples of program/project work breakdown structures are given (Tables 4-1 and 4-2) to show various applications and how these relate to the Agency Wide Coding Structure. These are only examples since any PWBS or CWBS will vary by the type of project or contract involved.

In developing PWBSs, NASA project personnel should refer to the Agency Wide Coding Structure which contains work breakdown structures for all kinds of programs/projects. These have been tailored to the particular requirements of the program or project. Care should be exercised in preparing new WBSs not to perpetuate any mistakes or undesirable features of previous WBSs. Program/project personnel should discuss the adequacy of the previous WBS with the managers of those projects.

401 PWBS CHECKLIST

The following checklist will be found useful as a guide in preparing PWBSs and to determine if all factors have been considered during the process of preparation:

1. Identify the program/project in the Agency Wide Coding Structure.
2. Develop the PWBS structure by subdividing the total effort into discrete and logical subelements. Usually a program subdivides into projects, major systems, major subsystems and various lower levels until a manageable size element level is reached. Wide variations may occur depending upon the type of effort (e.g., major systems development, support services, etc.). Include more than one center and more than one contractor if this reflects the actual situation.
3. Check the proposed PWBS and the contemplated efforts for completeness, compatibility and continuity.
4. Determine that the WBS satisfies both functional (Engineering-Manufacturing-Test) and program/project (hardware, services, etc.) requirements including recurring and nonrecurring costs.
5. Check to determine if the PWBS provides for logical subdivision of all project work.
6. Establish assignment of responsibilities for all identified effort to specific organizations; i.e., internal NASA as well as contractor.
7. Check the proposed PWBS against the reporting requirements of the organizations involved. This reporting should progress from the lowest level where information is collected up to and including the program level per FMM 9100.

8. Recheck numbering or code to assure incorporation of the AWCS, to assure successive levels of indenturing from the top down to the levels utilized for management control, to assure upward summarization by level, and to assure compatibility with the proposed CWBS.

402 CWBS CHECKLIST

1. Develop a preliminary CWBS to not lower than the top three levels for solicitation purposes (or lower if deemed necessary for some special reason).
2. Assure that the contractor is required to extend the preliminary CWBS in response to the solicitation, to identify and structure all contractor work to be compatible with his organization and management system.
3. Following negotiations, the CWBS included in the contract should not normally extend lower than the third level.
4. Assure that the negotiated CWBS code structure is compatible with the AWCS and that summarization into the PWBS (by machine or other techniques) is possible.
5. Assure that the negotiated CWBS is compatible with the contractor's organization and management system.
6. Review the CWBS elements to insure correlation with:
 - a. the specification tree
 - b. contract line items
 - c. end items of the contract
 - d. data items required
 - e. work statement tasks
 - f. configuration management requirements.
7. Define CWBS elements down to the level where such definitions are meaningful and necessary for management purposes. (WBS Dictionary)
8. Specify reporting requirements for selected CWBS elements if variations from standard reporting requirements are desired.
9. Assure that the CWBS covers measurable effort, level of effort, apportioned effort and subcontracts.
10. Assure that the total costs at a particular level will equal the sum of the costs of the constituent elements at the next lower level.
11. After a contract is awarded, to the extent appropriate, integrate modifications or changes involving redesign, rework, retooling. Retesting and refurbishing shall be contained in the appropriate related CWBS element, not as separate elements.

TABLE 4 - 1

EXAMPLE OF CONTRACTOR'S EXTENSION OF
CONTRACT WORK BREAKDOWN STRUCTURE*
*(AS SHOWN IN THE RFP)

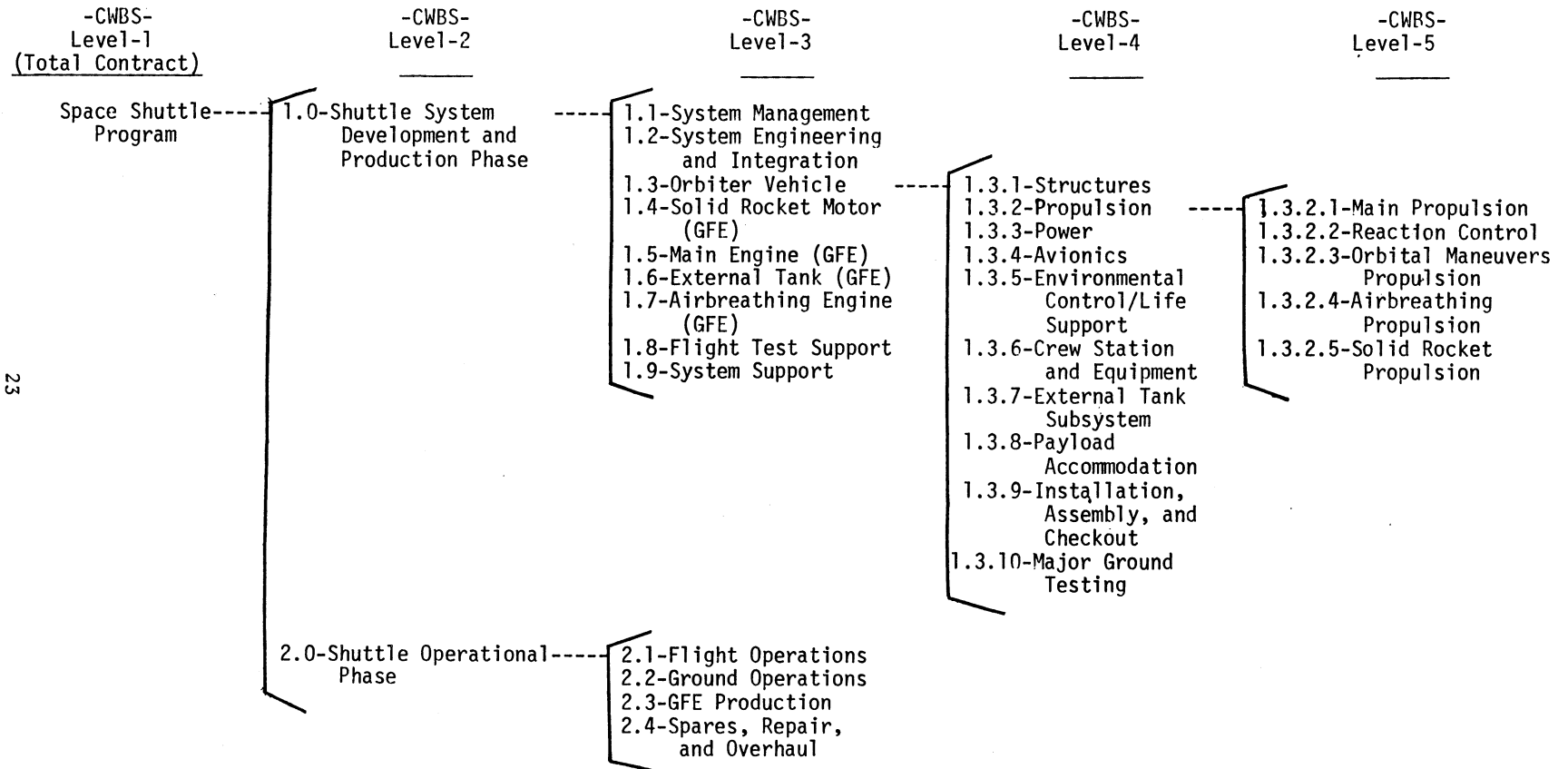


TABLE 4 - 2

- EXAMPLE -

SPACE SHUTTLE PROGRAM/PROJECT* AND CWBS INTERFACE
 *PER AGENCY WIDE CODING STRUCTURE - FMM 9100

<u>PWBS Budgeting Item Level</u>	<u>PWBS Project Level</u>	<u>PWBS System Level</u>	<u>CWBS Level - 1</u>
<u>FMM 9100 CODE #</u>	<u>FMM 9100 Code #</u>	<u>FMM 9100 Code #</u>	<u>Per RFP (Total Contract)</u>
96 Space Flight Operations	961 Spacecraft Modifications		
	964 Saturn Workshop		
	965 Telescope Mount		
	966 Apollo/Soyuz Test Project		
	970 Space Life Sciences		
	972 Saturn IB Vehicle		
	973 Saturn V Vehicle		
	974 Space Station Modules		
	975 Payloads		
	976 Space Shuttle		
	9-- And Others (FMM 9100)		
		10 Orbiter	
		20 Booster	
		30 Prelim Design Verif. (OMSF)	
		40 Engine	
		70 Prelim Design Verif. (OAST)	
		89 Project Management	
			Space Shuttle Program

APPENDIX A: GLOSSARY

Contract Work Breakdown Structure (CWBS)

A work breakdown structure of the products or services to be furnished under contract. It is comprised of selected PWBS elements specified in the contractual document and the contractor's lower level extensions thereof.

High Risk Item

A hardware item which (1) involves technological, manufacturing or other state-of-the-art advances or considerations, (2) is critical from the standpoint of achieving program objectives, reliability, maintainability, safety, quality assurance or other such factors, (3) program/project management designates as requiring special attention.

Program

A related series of activities which continue over a broad period of time (normally years) and which are designed to accomplish broad scientific or technical goals or increase knowledge in an area of space science or engineering.

Project

Within a program, an undertaking with a scheduled beginning and ending which normally involves one of the following primary purposes:

1. The design, development and demonstration of major advanced hardware items;
2. The design, construction and operation of a new launch vehicle (and associated spacecraft and ground support) during its research and development phase; or
3. The construction and operation of a new launch vehicle and necessary ground support in order to accomplish a scientific or technical objective in space; or
4. The development and construction of a major facility including necessary equipment and instrumentation.

Program/Project Work Breakdown Structure (PWBS)

A work breakdown structure which describes the total program and/or project in conformity with the Agency-Wide Coding Structure contained in NASA Financial Management Manual 9100.

Request for Proposal (RFP)

A Request for Proposal is an official procurement document which requests proposals from potential contractors (offerors) when the procurement is to be conducted by negotiation rather than by formal advertising.

Statement of Work (SOW)

A description of a product or service to be procured under a contract. A statement of requirements.

Specification Tree

A graphic portrayal arranged to illustrate interrelationships of hardware and/or software performance/design requirements specifications; normally, this portrayal is in the form of a "family tree" subdivision of the specifications with each lower level specification applicable to a hardware/software item which is part of a higher level item.

Subsystem

Name for the next level of a work breakdown structure under system. •
A functional entity within a system.

System

One of the principal functioning entities comprising the project hardware within a project or flight mission. The terminology may vary to suit a particular project. Ordinarily, a "system" is the first major subdivision of project work.

Work Breakdown Structure (WBS)

Generically, a WBS is a family tree subdivision of effort to achieve an end objective (e.g., program, project, contract, etc.). The WBS is developed by starting with the end objective required and successively subdividing it into manageable components in terms of size and complexity, such as a program, project, system, subsystems, components, tasks, subtasks, and work elements. It should be product or task oriented and should include all the necessary effort which must be undertaken to achieve the end objective.

Work Breakdown Structure Element

Any "block" or unique entry in a work breakdown structure regardless of level.

Work Breakdown Structure Levels

The arrangement or configuration of a work breakdown structure which establishes an indenture of projects to programs, systems to projects, subsystems to systems, etc.

Work Package

The unit of work required to complete a specific job such as a report, a design, a drawing, a piece of hardware, or a service which is within the responsibility of one operating unit in the performing organization. Usually the lowest element shown in a work breakdown structure.